Zootaxa 3586: 187–194 (2012)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

urn:lsid:zoobank.org:pub:3692FAAA-71A3-4B34-B6B7-92941F1B3B09

A new species of the genus *Triplophysa* (Cypriniformes: Nemacheilidae), *Triplophysa longliensis* sp. nov, from Guizhou, China

QIU REN[1,2], JUN-XING YANG[1,3]& XIAO-YONG CHEN[1,3]

[1]*State Key Laboratory of Genetic Resources and Evolution, Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming,Yunnan 650223, P.R. China*
[2]*Graduate School of Chinese Academy of Sciences, Beijing 100049, P.R. China*
[3]*Corresponding author. E-mail: yangjx@mail.kiz.ac.cn; chenxy@mail.kiz.ac.cn*

Abstract

A new species of nemacheilid loach, *Triplophysa longliensis*, is described from Yudonghe River, a small tributary of Pearl River in Guizhou Province, China. It can be distinguished from other valid *Triplophysa* loaches by the following combination of characters: body smooth and scaleless; head tapering; lips thin and smooth; posterior chamber of gas bladder highly developed, long, bag-shaped, tip reaching origin of pelvic fin; intestine short, bending in zigzag shape behind stomach; insertion of pelvic fin posterior to dorsal-fin origin; dorsal-fin origin closer to snout tip than to caudal-fin base; caudal fin deeply forked, upper lobe obviously longer than lower one; pelvic-fin tip reaching to anus.

Key words: *Triplophysa*; Guizhou; Pearl River; China

Introduction

The genus *Triplophysa* Rendahl, 1933, is one of the largest groups in the family Nemacheilidae, including approximately 125 valid species, more than 85% of which are so far known from China (Froese & Pauly 2011; He 2008; Yang *et al.* 2012). It is known primarily from the Qinghai-Tibet Plateau and adjacent areas (Zhu 1989; Wu & Wu 1991), and distributed in the upper and middle Yangtze River, Nujiang River (upper Salween River), Lancangjiang River (upper Mekong River), Red River, Yellow River, and Pearl River drainages of China, upper Indus and Tigris River drainages of West Asia, and in river drainages of Central Asia as well (Zhu 1989; Zhou & Cui 1997; Prokofiev 2006). *Triplophysa* is uniquely distinguished by having a marked sexual dimorphism, males with an area of breeding tubercles between snout and eye on each side of head, and a thickened tuberculate pad on the dorsal surface of the outer broadened pectoral-fin rays (Zhu 1989).

In 2010, some medium-sized loaches were collected from a subterranean river of Pearl River basin at Baisheng village, Longli County, Guizhou Province, China. Through our examining, it represents a new species of genus *Triplophysa*. It is described herein and compared with species of the same drainage.

Materials and methods

All counts and measurements follow the methods of Kottelat (1990) and Prokofiev (2007). Measurements were taken point to point to the nearest 0.1mm with digital calipers. Additional measurements, i.e., predorsal length was measured from the snout tip to the dorsal-fin origin; postorbital length was measured from the posterior margin of the eye to the posterior end of the operculum; pectoral-anal distance was measured from the pectoral-fin origin to the anal-fin origin; vent-anal distance was taken from the vent to the anal-fin origin. Gill rakers refer to the count on the inner side of the first arch. Specimens examined are deposited in the collection of the Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming (KIZ). Abbreviations used in this paper are: SL, standard length; HL, head length; ex., examined specimens; vs., versus.

Accepted by L. Mayden: 29 Oct. 2012; published: 14 Dec. 2012

***Triplophysa longliensis* sp. nov.**
(Fig. 1)

Holotype. KIZ 2010002988, 81.6 mm SL; Yudonghe River (26°14′53.87″N; 106°52′59.51″E), a tributary of Hongshuihe River (upper reach of Pearl River), at Baisheng Village, Longli County, Guizhou Province, China, 06 July 2010, collected by Wang Guangrong.

Paratypes. KIZ 2010002987, 2010002989, 2 ex., 80.5–100.5 mm SL, 06 July 2010, collected with the holotype. KIZ 20100084–87, 4 ex., 61.0–77.8 mm SL, 07 October 2010, collecting data same as for holotype.

FIGURE 1. *Triplophysa longliensis* sp. nov. KIZ 2010002988, holotype, 81.6 mm SL. (A) lateral view, (B) dorsal view, (C) ventral view.

Diagnosis. Skin smooth and scaleless; lateral line complete; head tapering and relatively narrow (head length 22.3–26.1% SL); eyes small (eye diameter 9.5–11.5% HL); lips thin and smooth; lower jaw spoon-like; anterior trunk subcylindrical and laterally compressed posteriorly; caudal peduncle slender and compressed, length 15.7–18.7% SL; posterior chamber of air bladder highly developed, long and bag-shaped, tip reaching origin of pelvic fin; intestine short, bending in zigzag shape behind stomach; insertion of pelvic fin posterior to dorsal-fin origin; dorsal-fin origin closer to snout tip than to caudal-fin base; caudal fin deeply forked, upper lobe obviously longer than lower one; pelvic-fin tip reaching to anus.

Description. D III, 8; A III, 5; P I, 10; V I, 6; C 15–16; inner gill rakers: 11–12; vertebrae: 4+38 (3 specimens).

Morphometric and proportional measurements are given in Table 1. Body elongate, anterior trunk subcylindrical, posterior portion laterally compressed. Caudal peduncle laterally compressed and depth reduced slowly towards caudal-fin base. Greatest body depth in front of dorsal-fin origin. Head depressed and nearly triangular when dorsally viewed, depth less than width. Snout pointed, snout length less than postorbital head length. Eyes small, eye diameter less than interorbital width, closer to snout tip than to end of operculum, close to dorsal profile of head, not visible in ventral view. Anterior and posterior nostrils closely situated, centers of nostrils

closer to anterior margin of eye than to snout tip; anterior nostril in short tube, with moderately elongated barbel-like tip; posterior nostrils larger than anterior ones.

Mouth inferior and arched. Lips thin and smooth; upper lip slightly furrowed, without median incision; lower lip with well-marked median incision, medially slightly furrowed and laterally smooth. Upper jaw covered by upper lip, some mature males with a weak processus dentiformis; lower jaw scoop-shaped, medially uncovered by lower lip (Fig. 2B). Three pairs of barbels; inner rostral barbels reaching corners of mouth; outer rostral barbels the longest, extending beyond posterior margin of eye; maxillary barbel horizontally reaching anterior margin of eye.

Fins long. Dorsal fin emarginate, its origin closer to snout tip than to caudal-fin base, last unbranched ray longest, slightly less than head length. Pectoral fin long, close to pelvic-fin origin. Pelvic-fin origin slightly posterior to dorsal-fin origin, much closer to anal-fin origin than pectoral-fin origin, fin tip reaching to anus. Anal fin emarginate. Anus close to anal-fin origin, vent-anal distance greater than eye diameter. Caudal fin forked; upper lobe obviously longer than lower lobe; tips pointed.

TABLE 1. Morphometric characters of *Triplophysa longliensis*.

Morphometric characters	Holotype	Paratypes (n = 6)			
		Min	Max	Mean	SD
Standard length (SL) (mm)	81.6	61.1	100.5		
% SL					
Body depth	13.3	11.2	16.4	14.7	1.8
Head length (HL)	22.3	22.3	26.1	24.2	1.4
Dorsal-fin length	22.3	20.1	22.4	21.3	0.9
Pelvic-fin length	16.9	15.9	18.6	17.7	1.0
Pectoral-fin length	19.7	19.7	24.0	21.7	1.4
Anal-fin length	17.9	16.4	19.3	17.8	1.0
Caudal-fin length	21.8	21.6	25.7	23.3	1.6
Predorsal length	48.5	48.5	52.1	50.6	1.5
Postdorsal length	50.8	48.8	52.4	50.3	1.4
Preanal length	74.9	73.1	76.6	75.5	1.3
Prepelvic length	52.1	52.1	54.5	53.3	0.7
Prepectoral length	24.6	24.6	27.9	26.8	1.1
Caudal-peduncle length	17.1	15.7	18.7	16.8	1.1
Caudal-peduncle depth	6.2	6.2	7.3	6.9	0.4
Pectoral-pelvic distance	29.7	26.8	29.7	28.1	0.8
Pectoral-anal distance	51.9	50.4	52.6	51.7	1.0
Pelvic-anal distance	23.0	22.2	24.2	23.2	0.9
Head length (HL) (mm)	18.2	15.3	23.1		
% HL					
Head depth	46.7	46.5	52.3	49.8	2.1
Head width	54.2	54.2	62.5	59.8	2.8
Snout length	39.4	38.1	44.1	41.4	2.3
Eye diameter	11.5	9.5	11.5	10.8	0.6
Interorbital width	32.4	31.4	37.5	34.5	2.1
Postorbital length	47.4	45.1	49.3	46.9	1.9
Inner rostral barbel length	18.9	18.1	23.9	20.6	2.2
Outer rostral barbel length	35.8	34.3	45.7	39.8	4.6
Maxillary barbels length	32.5	32.5	38.1	35.0	1.9
Vent-anal distance	16.4	13.5	18.0	15.7	1.7

Body smooth and scaleless. Cephalic lateral-line system well developed. Lateral line complete and straight, ending at caudal-fin base. Peritoneum pale. Intestine short, bending in zigzag shape behind stomach (Fig. 2D). Bony capsule of air bladder dumbbell-shaped; posterior chamber highly developed, connecting anterior air bladder with short tube; long, bag-shaped (Fig. 2C), tip of bladder reaching or surpassing origin of pelvic fin but not reaching anus.

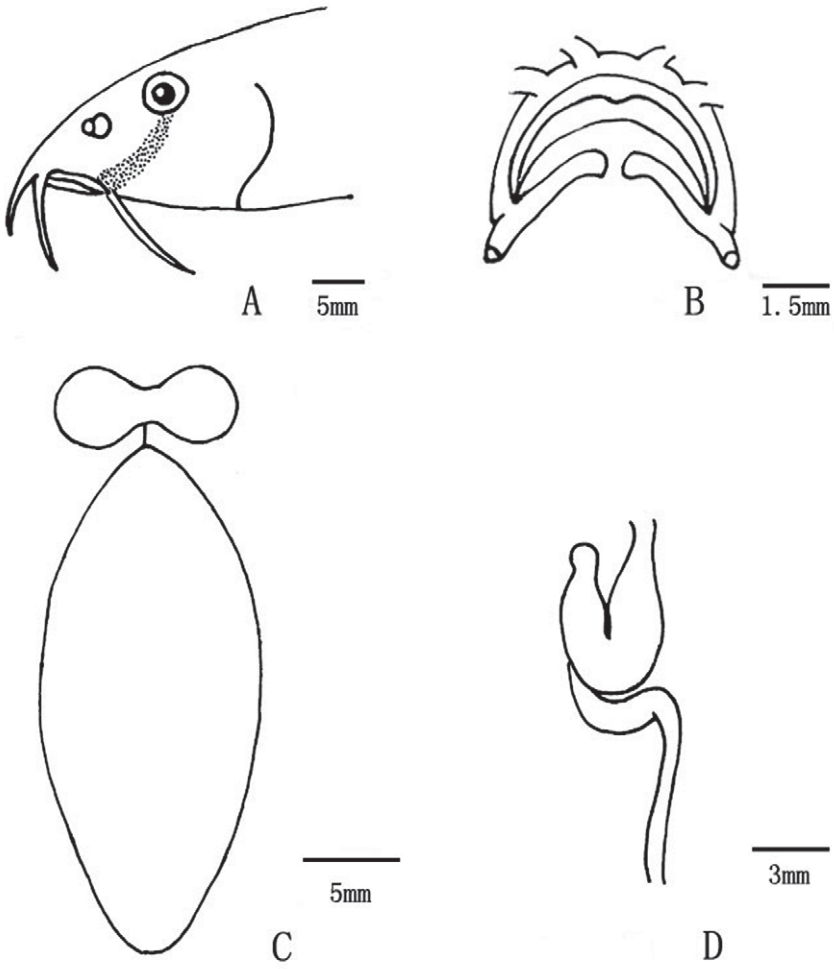

FIGURE 2. *Triplophysa longliensis* sp. nov. (A) lateral view of head, showing the area of breeding tubercles; (B) mouth, showing the processus dentiformis on the upper jaw; (C) air bladder; (D) stomach and intestine.

Sexual dimorphism. Mature males have broadened and thickened unbranched rays and 5 outer branched rays of pectoral fin covered with breeding tubercles on dorsal surfaces. Breeding tubercles present on both sides of head in a patch extending from anterior lower margin of orbital to base of outer rostral barbel (Fig. 2A). Females do not have these characteristics.

Color pattern. Ground color of body light yellow, fading to pale gray in alcohol preservative. Fin membranes hyaline and slightly gray, with melanophores scattered. Four of the specimens examined have 5–6 obscure black blotches along dorsal midline; width of each blotch far less than interval between blotches. The other three specimens are mottled. Body has some irregular obscure dark blotches dorsally and laterally. Black spot present on top of head. Black basal bar on caudal-fin base.

Distribution. *Triplophysa longliensis* is known only from the type locality (Fig. 3). The habitat of the species is shown in Figure 4.

Etymology. The specific epithet *longliensis* is derived from the Chinese Pinyin Longli (type locality) and Latin suffix (*ensis*).

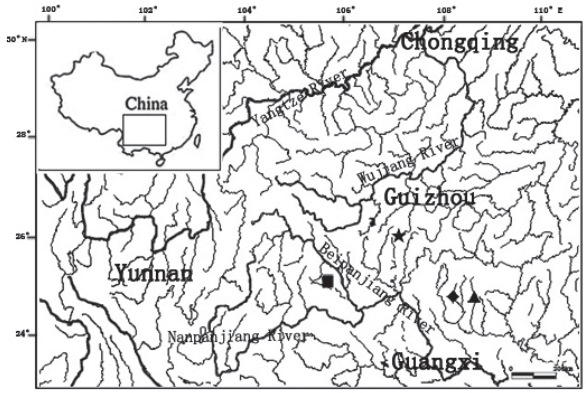

FIGURE 3. Distribution of species of *Triplophysa*: *T. longliensis* (★), *T. zhenfengensis* (■), *T. nasobarbatula* (▲) and *T. longibarbatus* (◆) in Guizhou Province, China.

FIGURE 4. The habitat of *Triplophysa longliensis*. Note the outlet of the subterranean river.

Discussion

Guizhou is a province where karst limestone caves and underground rivers are highly developed. Only three *Triplophysa* species were known from this area until now, namely, *T. nasobarbatula* Wang & Li, *T. zhenfengensis* Wang & Li and *T. longibarbatus* (Chen, Yang, Sket & Aljancic). All of them are distributed in the Pearl River drainage, as is the new species described herein. Until now, twenty one valid species of *Triplophysa* have been described in this river drainage (Chu & Chen 1979; Zhu & Guo 1985; Zhu & Cao 1988; Yang & Chu 1990; Yang 1990; Chen *et al.* 1992; Lan *et al.* 1995; Chen *et al.* 1998; Li & Zhu 2000; Wang & Li 2001; Chen *et al.* 2004; Yang *et al.* 2004; Li 2004; Li *et al.* 2008; Du *et al.* 2008; Chen *et al.* 2009; Zheng *et al.* 2009; Yang *et al.* 2011; Yang *et al.* 2012). They are *Triplophysa gejiuensis* (Chu & Chen), *T. macrophthalma* Zhu & Guo, *T. nanpanjiangensis* Zhu & Cao, *T. fuxianensis* Yang & Chu, *T. lacustris* Yang & Chu, *T. macromaculatus* Yang, *T. yunnanensis* Yang, *T. shilinensis* Chen & Yang, *T. nandanensis* Lan, Yang & Chen, *T. longibarbatus*, *T. aluensis* Li & Zhu, *T. nasobarbatula*, *T. zhenfengensis*, *T. flavicorpus* Yang, Chen & Lan, *T. tianeensis* Chen, Cui & Yang, *T. xiangshuingensis* Li, *T. qiubeiensis* Li & Yang, *T. parvus* Chen, Li & Yang, *T. longipectoralis* Zheng, Du, Chen & Yang, *T. huanjiangensis*, Yang, Wu & Lan and *T. macrocephala* Yang, Wu & Yang.

Triplophysa tianeensis, *T. aluensis*, *T. gejiuensis*, *T. shilinensis*, *T. longibarbatus*, *T. qiubeiensis*, *T. huanjiangensis* and *T. macrocephala* share the following characters: scaleless; eyes vestigial or absent; pigmentation degenerated or completely absent; barbels developed; caudal fin forked; all are cave-dwelling species. The new species can be easily differentiated from these species by the following characters: eyes present and normal; pigment present and colors mottled. *Triplophysa lacustris*, *T. fuxianensis* and *T. macrophthalma* share the following characters: body nearly cylindrical; eyes large, eye diameter larger than interorbital width; caudal fin emarginate; posterior chamber of air bladder reduced. These characters can be easily distinguished from those of *T. longliensis*.

Triplophysa longliensis can be distinguished from *T. longipectoralis*, *T. yunnanensis*, *T. flavicorpus*, *T. nasobarbatula* and *T. zhenfengensis* by its scaleless body. It can be further distinguished from *T. longipectoralis* by the following characters: eyes present and normal (vs. small and vestigial); pectoral fin not reaching pelvic-fin origin (vs. pectoral fin highly developed, reaching beyond pelvic-fin origin); posterior chamber of gas bladder highly developed (vs. degenerated). It can be further distinguished from *T. nasobarbatula* by the following combination of characters: tip of pelvic fin reaching to anus (vs. not reaching to anus); posterior chamber of gas bladder highly developed (vs. degenerated); caudal fin deeply forked (vs. slightly forked). It can be further distinguished from *T. zhenfengensis* by the following characters: branched dorsal-fin rays 8 (vs. 7); no spot on checks (vs. worm-shaped spots on checks); posterior chamber of gas bladder highly developed (vs. degenerated). It can be further distinguished from *T. yunnanensis* by the following characters: caudal fin deeply forked (vs.

emarginated); posterior chamber of gas bladder highly developed (vs. degenerated); tip of pelvic fin reaching to anus (vs. not reaching to anus). It can be easily distinguished from *T. flavicorpus* by the following character combination: branched dorsal-fin rays 8 (vs. 10); branched pelvic-fin rays 10 (vs. 11); lips thin and with few shallow furrows (vs. lips thick and with strong furrows and mastoids); auxiliary pelvic lobe absent (vs. present at pelvic-fin base).

Triplophysa longliensis is most similar to *T. nandanensis* by having branched dorsal-fin rays 8, anal-fin rays 5, caudal-fin rays 15–16, scaleless, snout pointed, trunk subcylindrical anteriorly and laterally compressed posteriorly, caudal fin forked. However, it can be further distinguished from *T. nandanensis* in having a weak processus dentiformis on upper jaw of the mature male (vs. absent); tip of pelvic fin reaching to anus (vs. not reaching to anus); posterior chamber of gas bladder highly developed (vs. degenerated). *Triplophysa longliensis* is similar to *T. nanpanjiangensis* by upper jaw with a weak processus dentiformis, but it can be differentiated from it by a set of characters: posterior chamber of air bladder highly developed (vs. degenerated); tip of pelvic fin reaching to anus (vs. not reaching to anus); caudal fin deeply forked (vs. emarginated).

Triplophysa longliensis can be differentiated from *T. macromaculatus* by the following characters: branched pectoral-fin rays 10 (vs. 11); branched pelvic-fin rays 6 (vs. 7); body elongate, trunk subcylindrical anteriorly and laterally compressed posteriorly (vs. body cylindrical); caudal fin deeply forked (vs. emarginated); posterior chamber of air bladder highly developed (vs. degenerated). *Triplophysa longliensis* can be distinguished from *T. parvus* by the following characters: caudal-peduncle length 15.7–18.7% of SL (vs. 18.0–20.0% of SL); eye diameter 9.5–11.5% HL (vs. 17.6–21.4% of HL); lips thin and smooth (vs. thick and well developed); posterior chamber of air bladder highly developed, long and bag-shaped (vs. reduced to a small, free protuberance). *Triplophysa longliensis* can be distinguished from *T. xiangshuingensis* by the following characters: peritoneum pale (vs. light yellow); posterior chamber of air bladder highly developed (vs. degenerated); tip of pelvic fin reaching to anus (vs. not reaching to anus); 5–6 obscure black blotches along dorsal midline (vs. 4 large dark brown saddle-like blotches along dorsal midline).

Comparative material

Triplophysa nasobarbatula Wang & Li: KIZ 2005001325-27, 2005001276, 2005001751, 5 ex., 31.7–41.3mm SL, Liujiang River Basin: Libo County, Guizhou Province, China.

Triplophysa longibarbatus (Chen, Yang, Sket & Aljancic): KIZ 1995000636, holotype, 68mm SL; 1995000637-38, paratypes, 2 ex., 29.3–30.6 mm SL, 1984001797-800, 4 ex., 31.8–56.4mm SL; Liujiang River Basin: Libo County, Guizhou Province, China.

Triplophysa gejiuensis Chu & Chen: KIZ 7803001, holotype, 49mm SL; 7803002-005, paratypes, 6 ex., 36.5–45.8 mm SL, Nanpanjiang River Basin: Gejiu County, Yunnan Province, China.

Triplophysa nanpanjiangensis Zhu & Cao: KIZ 2008006575-576, 2 ex., 58.4–62.4 mm SL, Nanpanjiang River Basin: Luoping County, Yunnan Province, China.

Triplophysa yunnanensis Yang: KIZ 874200, holotype, 62.9 mm SL; 874197, 874199, 2 paratypes, 2 ex., 48.5–62.2 mm SL, Nanpanjiang River Basin: Yiliang County, Yunnan Province, China.

Triplophysa macromaculatus Yang: KIZ 874021, holotype, 70.5 mm SL; 874022, paratype, 1 ex., 84.1mm SL, Nanpanjiang River Basin: Yiliang County, Yunnan Province, China.

Triplophysa fuxianensis Yang & Chu: KIZ 873126, holotype, 72.9 mm SL; 873127-128, 8611025-027, 8611029, paratypes, 6 ex., 58.5–83.6 mm SL, Nanpanjiang River Basin: Fuxianhu, Yunnan Province, China.

Triplophysa lacustris Yang & Chu: KIZ 01394-396, 01400-401, 01404, 01409, 01411-412, paratypes, 9 ex., 50.7–56.8 mm SL, Nanpanjiang River Basin: Xingyunhu, Yunnan Province, China.

Triplophysa shilinensis Chen & Yang: KIZ 913001, holotype, 59.8 mm SL; 913002, paratype, 1 ex., 59.6 mm SL, Nanpanjiang River Basin: Shilin County, Yunnan Province, China.

Triplophysa aluensis Li & Zu: KIZ 2006005-007, 3 ex., 43.9–83.2 mm SL, Nanpanjiang River Basin: Alu County, Yunnan Province, China.

Triplophysa tianeensis Chen, Cui & Yang: KIZ 200301003, holotype, 58.9 mm SL; 200301001-002, 200301004-006, paratypes, 5 ex., 36.8–62.1 mm SL, Hongshuihe River Basin: Tian'e County, Guangxi Zhuang Autonomous Region, China.

Triplophysa nandanensis Lan, Yang & Chen: KIZ 9110011, holotype, 61.0mm SL; 9110008-10, 9110012-9110017, paratypes, 9 ex., 56.7–71.1 mm SL, Hongshuihe River Basin: Nandan County, Guangxi Zhuang Autonomous Region, China.

Triplophysa flavicorpus Yang, Chen & Lan: KIZ 995003, 0011051-554, 00120610, 00120614, 00120624, 8 ex., paratypes, 51.5–83.5 mm SL, Hongshuihe River Basin: Du'an County, Guangxi Zhuang Autonomous Region, China.

Acknowledgements

This work was supported by the Knowledge Innovation Program of the Chinese Academy of Sciences (KSCX2-YW-Z-0922), the National Natural Science Foundation of China (30730017) and the National Basic Research Program of China (2007CB411600). We express our gratitude to Mr. Wang GR for collecting and donating the specimens of *Triplophysa longliensis*. We also thank Du LN, Zheng LP, Jiang WS for their assistance in the Kunming Institute of Zoology.

References

Chen, X.Y., Cui, G.H. & Yang, J.X. (2004) A new cave-dwelling fish species of genus *Triplophysa* (Balitoridae) from Guangxi, China. *Zoological Research*, 25, 227–231. [In Chinese with English abstract]

Chen, Y.R., Yang, J.X. & Xu, G.C. (1992) A new blind loach of *Triplophysa* from Yunnan stone forest with comments on its phylogenetic relationship. *Zoological Research*, 13, 17–23. [In Chinese with English abstract]

Chen, Y.R., Yang, J.X., Sket, B. & Aljancic, G. (1998) A new blind cave loach of *Paracobitis* with comment on its characters evolution. *Zoological Research*, 19, 59–63. [In Chinese]

Chen, Z.M., Li, W.X. & Yang, J.X. (2009) A new miniature species of the genus *Triplophysa* (Balitoridae: Nemacheilinae) from Yunnan, China. *Zoologischer Anzeiger*, 248, 85–91.

Chu, X.L. & Chen, Y.R. (1979) A new blind Cobitid Fish (Pisces, Cypriniformes) from subterranean waters in Yunnan, China. *Acta Zoological Sinica,* 25, 285–287. [In Chinese with English abstract]

Du, L.N., Chen, X.Y. & Yang, J.X. (2008) A review of the Nemacheilinae genus *Oreonectes* Günther with descriptions of two new species (Teleostei: Balitoridae). *Zootaxa*, 1729, 23–36

Froese, R. & Pauly, D. (2011) FishBase, World Wide Web electronic publication. Available from: http://www.fish base.org, version (09/2011).

He, C.L. (2008) Taxonomic revision of *Triplophysa* species in Sichuan Province. Master thesis, Sichuan University, Chengdu, China, 168pp. [In Chinese with English abstract]

Kottelat, M. (1990) *Indochinese Nemacheilines. A revision of Nemacheilinae Loaches (Pisces: Cypriniformes) of Thailand, Burma, Laos, Cambodia and southern Viet Nam.* Verlag Dr. Friedrich Pfeil, München, 262 pp.

Lan, J.H., Yang, J.X. & Chen, Y.R. (1995) Two new species of the subfamily Nemacheilinae from Guangxi, China (Cypriniormes: Cobitidae). *Acta Zootaxonomica Sinica*, 20, 366–372. [In Chinese with English abstract]

Li, W.X. & Zhu, Z.G. (2000) A new species of *Triplophysa* from cave Yunnan. *Journal of Yunnan University*, 22, 396–398. [In Chinese with English abstract]

Li, W.X. (2004) The three new species of Cobitidae from Yunnan, China. *Journal of Jishou University*, 25, 93–96. [In Chinese with English abstract]

Li, W.X. Yang, H.F., Chen, H., Tao, C.P., Qi, S.Q. & Han, F. (2008) A new blind underground species of the genus *Triplophysa* (Balitoridae) from Yunnan, China. *Zoological Research*, 29, 674–678. [In Chinese with English abstract]

Prokofiev, A.M. (2006) Redescription of *Triplophysa alticeps* (Herzenstein, 1888), the type species of the subgenus *Qinghaichthys* Zhu, 1981, with notes on its taxonomic position. *Journal of Ichthyology*, 46, 570–581.

Prokofiev, A.M. (2007) Materials towards the revision of the genus *Triplophysa* Rendahl, 1933 (Cobitoidea: Balitoridae: Nemacheilinae): a revision of nominal taxa of Herzenstein (1888) described within the species "*Nemachilus*" *stoliczkae* and "*N.*" *dorsonotatus*, with the description of the new species *T. scapanognatha* sp. nova. *Journal of Ichthyology*, 47, 1–20.

Wang, D.Z. & Li, D.J. (2001) Two new species of the genus *Triplophysa* from Guizhou, China (Cyprinformes: Cobitidae). *Acta Zootaxonomica Sinica*, 26, 98–101. [In Chinese with English abstract]

Wu, Y.F. & Wu, C.Z. (1991) *The fishes of Qinghai-Xizang Plateau*. Sichuan Publishing House of Science and Technology, Chengdu, 599 pp. [In Chinese]

Yang, J., Wu, T.J. & Lan, J.H. (2011) A new blind loach species, *Triplophysa huanjiangensis* (Teleostei: Balitoridae), from Guangxi, China. *Zoological Research*, 32, 566–571.

Yang, J., Wu, T.J. & Yang, J.X. (2012) A new cave-dwelling loach, *Triplophysa macrocephala* (Teleostei: Cypriniformes:

Balitoridae), from Guangxi, China. *Environmental Biology of Fishes*, 93, 169–175.
Yang, J.X. & Chu, X.L. (1990) Differentiation of three loaches of the genus *Triplophysa* in Nanpanjiang River basin, Yunnan (Pisces: Cobitidae). *Acta Zootaxonomica Sinica*, 15, 337–383. [In Chinese with English abstract]
Yang, J.X. (1990) Nemacheiline. *In*: Chu X.L., Chen Y.R. (Eds), *The fishes of Yunnan*, *China, Part II*. Science Press, Beijing, pp. 54–60. [In Chinese]
Yang, J.X., Chen, X.Y. & Lan, J.H. (2004) Occurrence of two new plateau-indicator loaches of Nemacheilinae (Balitoridae) in Guangxi with reference to zoogeographical significance. *Zoological Research*, 25, 111–116. [In Chinese with English abstract].
Zheng, L.P., Du, L.N., Chen, X.Y. & Yang, J.X. (2009) A new species of Genus *Triplophysa* (Nemacheilinae: Balitoridae), *Triplophysa longipectoralis* sp. nov, from Guangxi, China. *Environmental Biology of Fishes*, 85, 221–227.
Zhou, W. & Cui, G.H. (1997) Fishes of the genus *Triplophysa* in the Yuanjiang River (upper Red River) basin of Yunnan, China, with description of a new species. *Ichthyological Exploration of Freshwaters*, 8, 177–183.
Zhu, S.Q. & Cao, W.X. (1988) Descriptions of two new species and a new subspecies of Nemacheilinae from Yunnan Province (Cypriniformes: Cobitidae). *Acta Zootaxonomica Sinica*, 13, 95–100. [In Chinese with English abstract]
Zhu, S.Q. & Guo, Q.Z. (1985) Descriptions of a new genus and a new species of Noemacheiline loaches from Yunnan Province, China (Cypriniformes: Cobitidae). *Acta Zootaxonomica Sinica*, 10, 321–325. [In Chinese with English abstract]
Zhu, S.Q. (1989) The Loaches of the Subfamily Nemacheilinae in China (Cypriniformes: Cobitidae). Jiangsu Science and Technology Publishing House, Nanjing, 150 pp. [In Chinese]